

Amendments to the Specification:

Please replace paragraph [0002] with the following paragraph:

[0002] It is known to apply water based liquids or coolants to the grinding region between wheel and workpiece during grinding[[₅]]. However, such liquids have a disadvantage in that the water content has been found to mark or stain the surface of some workpiece materials, particularly glass components, around the grinding area, particularly the unground regions of component surfaces, which should remain clean. Such marking can be difficult to remove.

Please replace paragraph [0003] with the following paragraph:

(0003) It is an object of the present invention to provide a method of cooling and a coolant[[₅]] apparatus for delivering same during grinding, which will not mark or stain unground workpiece surfaces and is especially applicable to the grinding of glass components[[₅]] and a grinding machine for performing the method of cooling while grinding without marking or staining the unground workpiece surfaces.

Please replace paragraph (0004) with the following paragraph:

(0004) According to one aspect of the invention there is provided a method of cooling during grinding in which liquid nitrogen is applied to the contact region between the wheel and the workpiece for the purpose of cooling the wheel and workpiece without marking or staining unground regions of the workpiece surface by contact with the coolant. According to another aspect of the invention there is provided apparatus for supplying liquid nitrogen as a coolant for carrying away heat during the grinding of a workpiece by a rotating grinding wheel to enable a workpiece to be ground and the wheel

and workpiece to be cooled during the grinding process without marking or staining unground regions of the workpiece surface by contact with the coolant.

Please insert before paragraph [0022] the following:

Brief Description of the Drawings

Please replace paragraph [0023] with the following paragraph:

[0023] **Fig Figure 1** is a diagrammatic view of a grinding region cooled by liquid nitrogen,

Please replace paragraph [0024] with the following paragraph:

[0024] **Fig Figure 2** is a diagrammatic view of a surface grinding machine incorporating liquid nitrogen cooling, and

Please replace paragraph [0025] with the following paragraph:

[0025] **Fig Figure 3** is a diagrammatic view of an edge grinding machine incorporating liquid nitrogen cooling.

Please insert before paragraph [0026] the following:

Description of the Preferred Embodiment

Please replace paragraph [0026] with the following paragraph:

[0026] In **Fig Figure 1** a rotating grinding wheel 10 is shown engaging a flat upper surface or upper edge of a workpiece 12 and a nozzle 14 directing liquid nitrogen 16 towards the grinding region nip between wheel and workpiece. Flow of liquid nitrogen coolant is controlled by a valve 18.

Please replace paragraph [0027] with the following paragraph:

[0027] In **Fig Figure 2** the wheel 10, workpiece 12 and other apparatus of **Fig Figure 1** are shown mounted to a machine bed 20. A wheelhead drive is shown at 22. A

slideway 24 defines the X-axis movement of the wheelhead and X-axis traverse is achieved by a drive 26. The workpiece 12 may have a flat or profiled surface which is to be ground by wheel 10.

Please replace paragraph [0030] with the following paragraph:

[0030] The nozzle 14 ~~comprises~~ is carried by a Z-axis support 40 which includes a drive motor 42 for positioning the nozzle 14 at the required height and a motor 44 for moving the nozzle parallel to the X-axis of the machine, so that the nozzle can be positioned close to the point of contact between wheel and workpiece, and by operating the drives 42,44 as required, can follow the movement of the wheel relative to the workpiece. The upright part of the two-part support 40 is secured to the Z-axis platform 34 by a bracket 46.

Please replace paragraph [0031] with the following paragraph:

[0031] An insulated pressure vessel 48 contains liquid nitrogen and can be topped up via an inlet ~~49~~ 56. **A pressure sensor 50 is provided to generate a warning signal if the pressure in the vessel 48 drops below a predetermined pressure. An interlock can be provided to prevent resumption of grinding unless the source is replaced or replenished.** An insulated flexible supply pipe 52 is secured to the nozzle 14 via the on/off valve 18.

Please replace paragraph [0033] with the following paragraph:

[0033] **Fig Figure** 3 shows the invention applied to an edge grinding machine in which a circular disc-like workpiece 58 is mounted for rotation about a vertical axis on a rotary table 60 carried by the platform 34, and rotated by a rotary drive 62. The grinding

wheel 10 is now mounted for rotation about another vertical axis and the wheelhead drive 22 is now attached to the vertical face of a modified support part ~~30~~ **31**.

Please replace paragraph [0035] with the following paragraph:

[0035] All other parts are as described with reference to ~~Fig~~ **Figure** 2, the same reference numerals have been employed and reference is made to the foregoing description of **Figure** 2 for a description of the other parts of the machine and how it operates, except that instead of grinding the surface of workpiece 12 the wheel 10 now grinds the edge of the circular disc workpiece 58 as the latter rotates in contact with the wheel 10.

Insert the following paragraph after paragraph [0035]:

[0035a] Having thus described the invention, various modifications and alterations will occur to those skilled in the art, which modifications and alterations are intended to be within the scope of the invention as defined by the appended claims.

Please replace paragraph [0036] with the following paragraph:

A method of cooling during grinding in which liquid nitrogen is applied to the contact region between a rotating grinding wheel and a workpiece especially glass workpieces for cooling same without marking or staining unground regions of the workpiece surface by contact with the coolant. The workpiece may be rotated during grinding and may have a flat or profiled surface to be ground. A grinding machine ~~for performing the method~~ comprises **a source of liquid nitrogen, a nozzle, drive means for positioning the nozzle relative to the wheel and workpiece, and a control system to supply liquid nitrogen to the grinding region during grinding and to control the nozzle drive to**

direct liquid nitrogen towards the region of grinding contact between the wheel and workpiece. ~~a machine bed, a workpiece holder, workpiece drive means for moving the workpiece holder and a workpiece carried thereon, a grinding wheel, a drive by which the grinding wheel is rotated, a wheelhead carrying the wheel and drive therefor, a slideway by which the wheelhead can move relative to the workpiece, wheelhead drive means for moving the wheelhead, a source of liquid nitrogen, valve means and pipeline means communicating between the source and a nozzle, drive means for positioning the nozzle relative to the wheel and workpiece, and a control system for controlling the operation of each of the drive means and the valve means to supply liquid nitrogen to the grinding region during grinding and to control the nozzle drive means during grinding so as to move the nozzle to direct liquid nitrogen towards the region of grinding contact between the wheel and workpiece.~~

The control system also ~~controls the operation of the further drive means to~~ adjust the position of the nozzle during grinding so as to follow the movement of the wheel relative to the workpiece during the grinding.